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THE BRYOLOGIST

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NOTES ON NORTH AMERICAN HEPATICAE. VI

ALEXANDER W. EVANS

With Plate I

Two of the species discussed in the present paper, one from Nova Scotia and the other from Florida, are proposed as new. Of the remaining eight species three represent additions to the hepatic flora of the United States, while the others are included to record extensions of range. The new species from Florida and one of the additions from the same state belong to the Lejeuneae and increase the number of representatives of this group now known from Florida to thirty-five.

1. **Jamesoniella heterostipa** sp. nov.

Collected on July 6, 1910, at Barrington Passage, Cape Sable Island, Nova Scotia, on stones in a stream, by J. Macoun (No. 52).

Growing in depressed and irregular mats, dark green, somewhat tinged with brown: stems about 2 cm. long and 0.6 mm. in diameter, very sparingly branched, the branches (so far as observed) of the *Frullania* type, essentially like the stem; rhizoids sometimes abundant, pale, not restricted to definite parts of the ventral region: leaves imbricated, more or less horizontal in position, but variously revolute and vaguely plicate, spreading at an angle of about ninety degrees, ovate-orbicular, the best developed mostly 1.5–2 mm. long and 1.4–1.9 mm. wide, attached by a long oblique line, shortly and narrowly decurrent at the dorsal base, rounded at the ventral base, somewhat narrowed toward the rounded, truncate, or (rarely) emarginate apex, entire; leaf-cells about 19μ in diameter along the margin, 24μ in the middle, and 34μ at the base, isodiametric, thin-walled, but with small trigones having concave sides, cuticle smooth; underleaves very variable, sometimes minute and evanescent, sometimes much larger and persistent, those of the latter type filiform to ovate, free or sometimes coalescent on one side with a leaf, the apex long-acuminate to rounded, the margin entire; some of the largest underleaves attaining a length of 1.3 mm. and a width of 0.75 mm.: inflorescence probably dioicous: ♀ inflorescence terminal on the stem or an elongated branch; bracts in about two pairs, outer bracts similar to the leaves, but a little larger (about 2.4 x 2 mm.), sometimes with a small basal lobe, innermost bract a little smaller (about 1.8 x 1.5 mm.) irregularly lobed and lacerate, with marginal teeth of various sizes; innermost bracteole (about 2 x 0.9 mm.) deeply bifid with narrow acuminate lobes and irregularly toothed or lobed margins; perianth (very immature) deeply five-plicate with a large irregularly lobed mouth, the lobes acuminate with dentate to ciliate margins: remaining parts unknown. [PLATE I.]

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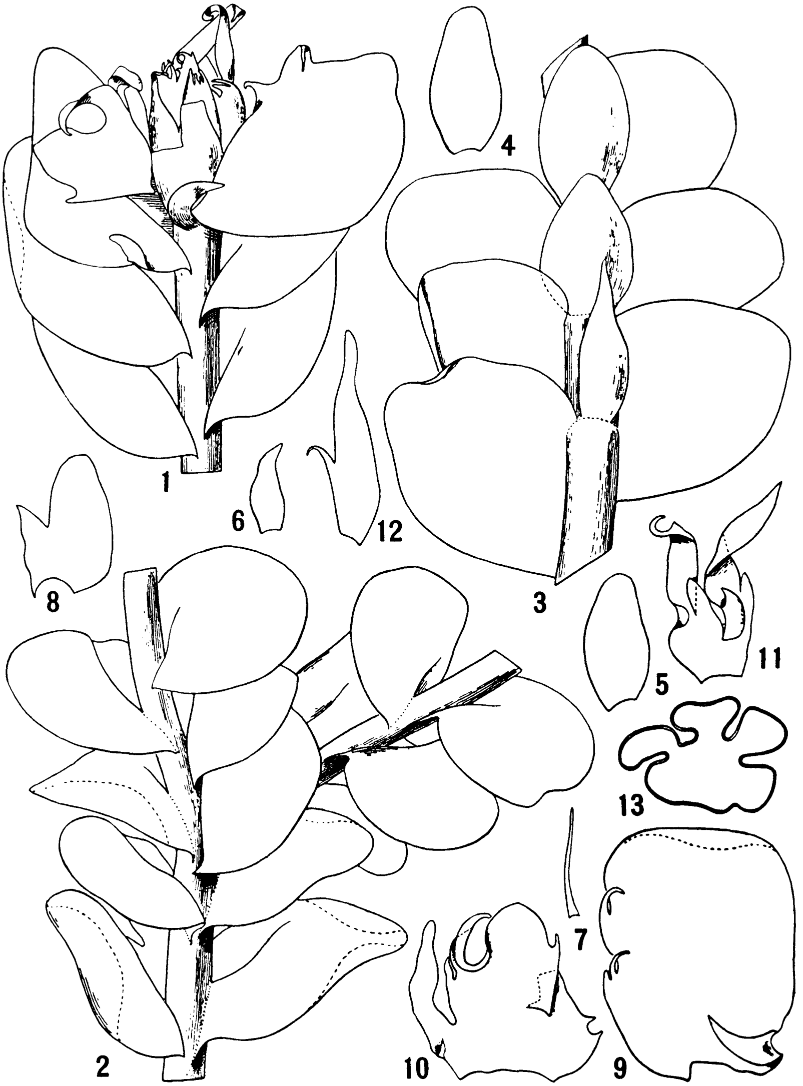

JAMESONIELLA HETEROSTIPA Evans

The specimens from which the above description was drawn are very incomplete. They show no signs of antheridial inflorescences and include but a single rudimentary perianth. In spite of these facts it seems justifiable to publish the species on account of its peculiar underleaves. These are exceedingly variable. In some cases they are so minute and so short-lived that they can scarcely be demonstrated at all. In other cases they are much larger and equal the leaves in firmness and persistency. The persistent underleaves, in turn, show all gradations between slender filiform structures and broad plates of cells, lanceolate to ovate in form and acuminate to rounded at the apex. In most cases these large underleaves are attached independently to the stem, but in exceptional cases an underleaf may be more or less coalescent with a side leaf. Another interesting feature of the species is the occasional approximation of the side leaves in pairs, so that on the dorsal surface of the stem their lines of attachment almost meet. The majority of the leaves, however, are clearly alternate.

The new species is closely related to *J. autumnalis* (DC.) Steph., which is exceedingly common in eastern North America on shaded rocks, rotten logs, and soil rich in humus. In *J. autumnalis* the leaf-cells agree in size and in structure with those of *J. heterostipa*, while the perichaetial bracts and the mouth of the perianth are essentially the same in the two species. In *J. autumnalis*, however, the plants are a little less robust, and the underleaves, although somewhat variable, are always small and do not show the great diversity in form found in the new species. The possibility of course remains that the divergent characters of *J. heterostipa* may be caused by its unusual habitat and that it may represent an aberrant form of *J. autumnalis;* but in the absence of proof to this effect the plant from Nova Scotia ought surely to be recognized as distinct.

The generic position of *Jungermannia autumnalis* DC. is far from established. Stephani transferred it to *Jamesoniella*, apparently on account of its toothed or lacerate perichaetial bracts, bracteole, and perianth. It occupies an anomalous position in this genus, however, on account of its general habit, its branches of the *Frullania* type, its cell-structure, and its distinct underleaves. In typical members of *Jamesoniella* the plants tend to be erect and the leaves to be erect and appressed; the branches seem to be invariably ventral and intercalary; the leaf-cells have large and nodulose trigones; and the underleaves of the stem are very rudimentary. Of course the large underleaves of *J. heterostipa* make it even more anomalous than *J. autumnalis*. Possibly the wisest course would be to make *J. autumnalis* the type of a new genus, as K. Müller[1] has already suggested.

2. PLAGIOCHILA SULLIVANTII Gottsche; Evans, Bot. Gazette **21**: 191. 1896 (in part). *P. allegheniensis* Evans; Stephani, Bull. Herb. Boissier II. **3**: 334. 1903.

Collected in a cañon at Tallulah Falls, Georgia, by J. K. Small, in April, 1893 (No. 9314). Hitherto known from only two localities: Virginia, without definite station, *Sullivant;* North Carolina, without definite station, specimen in the Lindenberg herbarium at Vienna. The reasons for discarding the name *P. allegheniensis* and for reserving the name *P. Sullivantii* for the species represented by Sullivant's Musc. Alleg. No. 219 have been stated by the writer in another connection.[1] For a figure of *P. Sullivantii* see Evans, Bot. Gazette **21**: *pl. 15, f. 19.* 1896.

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[1] Rabenhorst's Kryptogamen-Flora **6**: 578. 1910.

3. CEPHALOZIA FRANCISCI (Hook.) Dumort.

The geographical distribution of this rare species in North America is so incompletely known that the report of the following new stations seems justifiable: on moist soil in barren, mountains west of Ingonish, Cape Breton Island, Nova Scotia, *G. E. Nichols* (No. 813B); Southold and Orient Point, Long Island, New York, *R. Latham.* The last two stations, which represent a marked extension of the known range to the southward, are of especial interest and indicate that the plant ought to be looked for in eastern Connecticut and Rhode Island. In 1912 the writer[2] cited three stations for *C. Francisci* from Nova Scotia and Maine, no others being known from North America at that time and in 1913 Miss Lorenz discovered it in New Hampshire,[3] so that seven localities in all have now been reported.

4. CEPHALOZIA LEUCANTHA Spruce.

The range of this minute species in North America is still very incompletely known. It was first collected at Columbia Fiord, Alaska, by Coville and Kearney, while members of the Harriman Alaska Expedition, and a full account of the plant, with figures, was drawn up from their specimens by the writer.[4] It has since been reported from Hunker Creek, Yukon, *J. Macoun*;[5] from Port Renfrew, Vancouver Island, British Columbia, *Miss Gibbs, S. A. Skinner*;[6] and from Port Chatham, Alaska, *G. B. Rigg.*[7] It is now possible to add the following stations for the species: Bay of Islands, Newfoundland, 1901, *Howe & Lang* (No. 1077) in part; valley of the Barrasois River, Cape Breton Island, Nova Scotia, 1914, *G. E. Nichols* (No. 575); Douglas, Alaska, 1908, *Miss Clark* (Nos. 7, 13); Ucluclet, British Columbia, 1909, *J. Macoun* (No. 53); Westport, Washington, 1908, *A. S. Foster* (No. 766). It will be noted that some of these localities extend the known range of the species far to the eastward and considerably to the southward in the Pacific Coast region. At lower latitudes the plant grows on rotten logs, often in company with other species of *Cephalozia;* at higher latitudes it is more frequently met with in bogs.

5. HYGROBIELLA LAXIFOLIA (Hook.) Spruce.

Collected in 1914, at Smith's (North) Brook, Cape Breton Island, Nova Scotia, on flat rocks along a stream in a ravine, by G. E. Nichols (No. 629).

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[1] Rhodora **16**: 68. 1914.

[2] BRYOLOGIST **15**: 58. 1912.

[3] See Rhodora **16**: 75. 1914.

[4] Proc. Washington Acad. **2**: 306. *pl. 17, f. 18-26.* 1900.

[5] Ottawa Nat. **17**: 23 1903.

[6] Postelsia 1906: 226.

[7] Bull. Torrey Club **41**: 596 1915.

Although the authors of the Synopsis Hepaticarum, as long ago as 1845, listed the present species from Greenland it is known even now from very few localities in North America. Macoun,[1] in 1902, cites specimens from Labrador as well as from the original Greenland station, while Miss Lois Clark,[2] in 1909, makes the first record for the United States: namely, Paradise Valley, Mount Rainier, Washington where the plant was found by T. C. Frye in 1908. She likewise calls attention to some of the more important peculiarities of the species. The writer is unable to give any additional stations for the plant from the North American mainland, but the Cornell Party of the Peary Expedition of 1896 collected it on the Nugsuak Peninsula of Greenland. Miss Lorenz[3] has already listed *Hygrobiella laxifolia* from Nova Scotia, basing her record on the Cape Breton specimens. She predicts its discovery in Maine, and it ought to be looked for also in the moister parts of the Rocky Mountains.

6. **Cololejeunea tuberculata** sp. nov.

Collected in March, 1915, on leaves of *Trichomanes Krausii* Hook. & Grev., on Nixon-Lewis Hammock (No. 5250), on Sykes Hammock (No. 5257), and in pinelands about Timms Hammock, Dade County, Florida, by J. K. Small, C. A. Mosier, and E. W. Small; also on leaves of *Trichomanes sphenoides* Kunze, on Hattie Bauer Hammock, Dade County, Florida, by the same collectors. No. 5250 may be designated the type.

Plants very delicate, pale green, often becoming bleached with age, scattered or growing in thin mats: stems prostrate, about 0.03 mm. in diameter, irregularly and sometimes abundantly branched, the branches widely spreading, essentially like the stem: leaves distant to slightly imbricated, obliquely to widely spreading, plane or nearly so, the lobe sometimes deflexed at the apex, ovate, when well developed 0.18–0.2 mm. long and 0.12–0.13 mm. wide, but often considerably smaller, gradually narrowed to an acute or obtuse apex tipped with a single cell, both dorsal and ventral margins rounded in the basal half and straight in the apical half, denticulate from projecting cells; lobule often very rudimentary, when well developed ovate, about 0.09 x 0.075 mm., strongly inflated throughout, apical tooth usually consisting of two cells in a row, the hyaline papilla at the base of the tooth on the inner surface, proximal tooth shorter and usually consisting of a single blunt or acute projecting cell separated from the apical tooth by a single cell, sinus shallow, two or three cells long; cells at lobe averaging about 7μ along the margin, 10 x 8μ in the middle, and 14 x 8μ of the base, each bearing a median rounded wart on the outer surface, 4–6μ long, with the wall thickened at the apex, cell-walls otherwise thin throughout; cells of lobule in the region of the keel with similar but shorter warts; stylus none: inflorescence autoicous: ♀ inflorescence borne on a more or less abbreviated branch, innovating on one side, the innovation short and sterile and often obsolete; bracts obliquely spreading, more or less complicate, the lobe ovate, 0.2–0.25 mm. long and 0.07–0.09 mm. wide, sometimes inflexed at the acute apex, margin and outer surface as in the leaves, lobule ovate or ovate-oblong, 0.16–0.18 mm. long and 0.06–0.07 mm. wide, acute or obtuse to truncate, irregularly denticulate, outer surface more or less roughened from projecting cells at least in the vicinity of the keel; perianth broadly obovoid, about 0.3 mm. long and 0.22 mm. wide, bluntly five-keeled in the upper part when young, strongly inflated and practically without keels at maturity, beakless, surface to below the middle strongly roughened from projecting cells: ♂ inflorescence terminal on a more or

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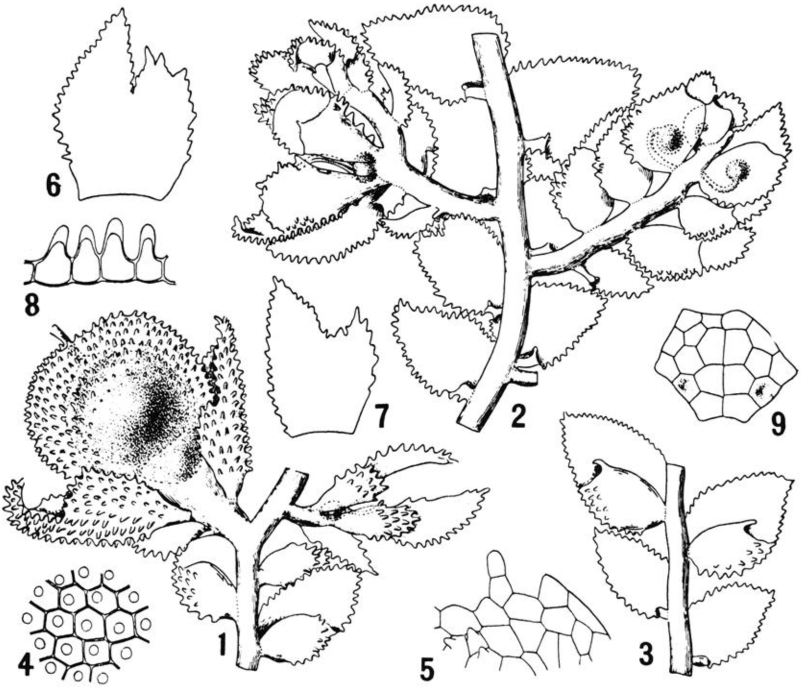
[1] Cat. Canadian Plants **7**: 31. 1902.

[2] Bull. Torrey Club **36**: 304. 1909.

[3] BRYOLOGIST **18**: 25. 1915.



COLOLEJEUNEA TUBERCULATA Evans

FIG. 1. Part of a plant with a perianth and an unfertilized female inflorescence, ventral view, x 100.

FIG. 2. Part of a plant with a female inflorescence and a male inflorescence, ventral view, x 100.

FIG. 3. Part of a sterile branch, ventral view, x 100.

FIG. 4. Cells from the middle of a lobe, x 300.

FIG. 5. Apex of a lobule, x 300.

FIGS. 6, 7. Bracts from a single inflorescence, x 100.

FIG. 8. Cells from the lobe of a bract, optical section, x 300.

FIG. 9. Gemma, x 300.

The figures were all drawn from the type specimen with the exception of FIG. 2, which was drawn from No. 5257.

less abbreviated branch, not proliferating (so far as observed); bracts in two or three pairs, similar to the leaves when well developed, but with less obliquely spreading lobes and poorly developed apical teeth on the lobules, monandrous: capsule about 0.15 mm. in diameter: gemmae about 0.06 x 0.05 mm., composed (normally) of sixteen cells, each apical quadrant cutting off two segments, margin with five obtusely projecting cells. [TEXT FIGS. 1–9.]

In its minute size and extreme delicacy *C. tuberculata* rivals the species of *Aphanolejeunea*, a characteristic example of which is noted below. The structure of the lobule, however, with its clearly marked teeth shows conclusively that the plant is not an *Aphanolejeunea*, and the inflated perianth with its five indistinct keels indicates that it is a true *Cololejeunea*.[1] Another species of *Cololejeunea*, *C. diaphana* Evans,[2] which was likewise discovered by Dr. Small in subtropical Florida, is only a trifle larger than *C. tuberculata* and is even more delicate in structure. *C. diaphana* has recently been recorded from Porto Rico by the writer, and it is probable that *C. tuberculata* also will be found in the West Indies.

One of the most striking features of the present species is the conspicuous roughness of the leaves and perianths. This is due to the development of a projection or tubercle on each cell of the lobe, and on each cell of the perianth except in the basal region. Even the cells of the lobules are more or less affected: on ordinary leaves and on the male bracts the tubercles are restricted to the neighborhood of the keel, but on the perichaetial bracts they sometimes occur on all the cells. In the tubercle the entire outer wall of the cell is involved, but the projection narrows to a rounded apex; here the wall exhibits a conspicuous thickening, which sometimes occupies about half the length of the entire tubercle. Roughness of the leaves is of widespread occurrence in the genus *Cololejeunea* and seems to be always due to projecting cells, but these are rarely so pronounced or so abundant as in *C. tuberculata*. There are, however, a few species which equal or even surpass *C. tuberculata* in roughness. One of these is *C. Rossettiana* (Massal.) Schiffn., a local European species now known from Italy, France, and the British Isles. In this remarkable plant, which is considerably larger than the new species from Florida, the tubercles show much the same structure, but they are found on all the cells of the lobules of ordinary leaves as well as on the cells of the lobes, and the apical thickening of the wall is sometimes more than half the length of the entire tubercle.

Among the species of *Cololejeunea* known from the United States the only one which resembles *C. tuberculata* very closely is *C. Biddlecomiae* (Aust.) Evans. This plant has a wide distribution from New England westward to Wisconsin and southward to Florida and Alabama. Although a small species it is not so minute as *C. tuberculata*, the leaves being about 0.35 mm. in length and the perianths measuring about 0.6 x 0.35 mm. In *C. Biddlecomiae* the ovate lobes narrow toward the apex, which may be obtuse or acute; the surface of the lobes is roughened from projecting cells, and the margin is denticulate or crenulate; the apical tooth of the lobule usually consists of a row of two cells; the inflorescence is often autoicous; and the five-keeled perianth is obovoid or oblong. In all these respects it agrees with *C. tuberculata.* The roughness of the leaves, however, is due to low rounded or conical protuberances, the wall being thin throughout or only slightly thickened at the apices of the projection; it often involves only a part of the lobe, the basal region being usually quite smooth; and it never involves the lobules at all, not even those of the perichaetial bracts. In *C. Biddlecomiae*, moreover, a well-developed filiform stylus is present at the base of the lobule, and the perianth has a distinct beak; whereas in *C. tuberculata* no trace of a stylus can be demonstrated, and the perianth is destitute of a beak.

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[1] For a discussion of the genus *Cololejeunea* and allied genera, see Evans, Bull. Torrey Club **38**: 251–286. *pl. 11, 12.* 1911.

[2] Bull. Torrey Club **32**: 184. *pl. 5, f. 9-14.* 1905.

The brief account of the gemmae included in the description must be accepted with some reservation because it is based on only three examples, two of which were immature and the third (TEXT FIG. 9) somewhat deformed. One of the immature gemmae was symmetrical, showing eight cells on each side of the median line, so that the right hand side of the figure probably represents the normal structure. On the left hand side the apical cell has cut off an additional segment, which has divided in the usual way by a periclinal wall, thus increasing the number of cells on that side to ten. Nothing is said in the description about organs of attachment and none were found on the two immature gemmae. The one figured, however, showed two such organs of attachment in the basal quadrants. In all probability the upper cell on the left hand side of the median wall would have formed organs of attachment also, if it had developed normally. Under these circumstances the gemma would have been essentially like that of the Porto Rican *Aphanolejeunea exigua* Evans, a description of which, with a figure, has already been published.[1]

7. APHANOLEJEUNEA SICAEFOLIA (Gottsche) Evans, Bull. Torrey Club **38**: 277. *pl. 12, f. 17–26.* 1911. *Lejeunea* (*Cololejeunea*) *sicaefolia* Gottsche; Stephani, Hedwigia **27**: 290. *pl. 12, f. 21–24.* 1888.

Collected in March, 1915, on Timms Hammock (No. 5287) and in pinelands about Nixon-Lewis Hammock, Dade County, Florida, on leaves of *Trichomanes Krausii*, by J. K. Small and C. A. Mosier. New to the United States; previously known Cuba, Porto Rico, and Trinidad. The Florida specimens are poorly developed, the largest leaves measuring only 0.27 mm. in length instead of 0.4 mm. as in more typical material. Probably on account of the poor development of the plants the lobes of the leaves are acute rather than acuminate, but in spite of this slight deviation from the typical condition, the agreement in habit, in cell-structure, and in the characteristics of the lobule is so complete between the material from Florida and the West Indian specimens, that they can safely be referred to the same species.

The gemmae of *A. sicaefolia* have not yet been described, although the plants from Porto Rico showed that these structures were developed by the species. In Small's specimens a very few gemmae are present. They measure about 0.07 x 0.055 mm. and agree in all essential respects with those of *A. exigua* and (presumably) with those of *Cololejeunea tuberculata.* In other words the gemma consists of sixteen cells, three of which develop organs of attachment, while five of the marginal cells project as blunt teeth.

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[1] Bull. Torrey Club **38**: 281, 284. *pl. 12, f. 10.* 1911.

In size and general appearance *A. sicaefolia* resembles *Cololejeunea diaphana*, but the very different lobules of the two species will at once distinguish them. In *A. sicaefolia*, moreover, the surface of the lobes is more or less roughened from projecting cells, while in *C. diaphana* the surface is smooth, the cells being plane or nearly so.

8. FRULLANIA BOLANDERI Aust.

Collected at Bic, Rimouski County, Quebec, by J. F. Collins, in July, 1907 (No. 5101). The present species is widely distributed along the Pacific Coast from British Columbia to California and was supposed to be confined to that region until very recently. A few months ago Conklin[1] reported it from Lake Nebagamon, Douglas County, Wisconsin, and the station recorded above extends its known range practically across the continent. Two Asiatic stations from the island of Sakhalin, based on collections made by the Abbé Faurie in 1908, may likewise be quoted: namely, Mereya, near Korsakovski (No. 124), and Kimonai (No. 102). Specimens from these two stations were distributed in Faurie's "Hépatiques du Japon."

A full description of *F. Bolanderi*, with figures, was published by the writer in 1897.[2] The species can usually be at once distinguished, even where sterile, by the upright flagelliform branches, which are present in greater or less abundance. These branches are limited in growth and give rise to organs of vegetative reproduction in the form of caducous leaves (Brutblätter). After these have fallen away the branches are leafless except for the persistent underleaves and the leaves of the terminal bud. Similar flagelliform branches have been described by the writer in certain tropical Lejeuneae.[3]

9. FRULLANIA MEXICANA Lindenb.; G. L. & N. Syn. Hep. 425. 1845.

Collected in May, 1912, on trees, north side of Mt. Lemmon, Catalina Mountains, Arizona, by D. S. Johnson. Although this is the first record for the United States, the writer would now refer to *F. mexicana* a specimen collected in New Mexico by E. O. Wooton in August, 1899, and already recorded under the name *F. inflata* Gottsche.[4] This specimen grew on oak, at Cloudcroft, Sacramento Mountains, at an altitude of 8500 feet. The original material of *F. mexicana* was collected somewhere in Mexico, no definite locality being given in the Synopsis Hepaticarum, and no other stations for the species are known at the present time.

Stephani, in his Species Hepaticarum (**4**: 329. 1910), refers *F. mexicana* to the subgenus *Chonanthelia*. Apparently, however, he is not altogether clear about the species because a few pages later in the same work he includes it among the synonyms of *F. tetraptera* Mont. As a matter of fact the plant is not a *Chonanthelia* at all but belongs to the subgenus *Trachycolea*. This fact is clearly brought out by original description of Lindenberg, who compares *F. mexicana* with *F. eboracensis* Gottsche, and by the type specimen preserved in the Lindenberg herbarium at Vienna. Through the kindness of Dr. Zahlbruckner this specimen was sent to the writer for examination. It is somewhat fragmentary, but shows perianths, androecia, and weathered capsules. Unfortunately the perichaetial bracteoles are not quite so well developed as might be desired and present the appearance of having been aborted in their growth. Except for these the specimen agrees in all essential respects with the material from Arizona and New Mexico.

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[1] Trans. Wisconsin Acad. **17**: 1008. 1914.

[2] Trans. Connecticut Acad. **10**: 8. *pl. 2.* 1897.

[3] See Bull. Torrey Club **33**: 10, 13. *pl. 1, f. 23.* 1906.

[4] BRYOLOGIST **13**: 36. 1910.

The inflorescence of *F. mexicana* is autoicous, and the species represents the seventh autoicous *Trachycolea* to be reported from the United States, the others being *F. Catalinae* Evans, *F. cobrensis* Gottsche, *F. inflata* Gottsche, *F. Oakesiana* Aust., *F. Rappii* Evans, and *F. saxicola* Aust. The plants are mostly 1–2 cm. long and vary in color from a pale greenish to a purplish brown. They grow scattered over the surface of the bark or form very loose tufts. The stems are irregularly pinnate and the branches are more or less subdivided, especially after the appearance of the sexual organs.

The leaves are sometimes distant, but are usually more or less imbricated. The lobes are somewhat convex, but never squarrose, and spread widely, sometimes almost at a right angle. They are broadly ovate and, on robust leaves, attain a length of about 0.75 mm. and a width of 0.6 mm. They are usually distinctly cordate at the dorsal base, arching beyond the axis, and are rounded at the junction with the keel; the apex is broad and rounded, and the margin is practically entire throughout. The lobule is of the type usual in *Trachycolea* and is almost always developed as a water-sac, rounded above, parallel along the sides, and truncate at the mouth. It lies erect or nearly so at a distance of about 0.03 mm. from the axis and measures about 0.35 x 0.3 mm. The inflation is often much more distinct in the rounded upper portion and along the outer edge, while the two lips at the mouth are often closely appressed. The stylus is a subulate process about 0.09 mm. long and 0.03–0.04 mm. wide at the base. Measured in cells it is mostly about six cells long and two to four cells wide at the base. The cells in the lobe average about 14μ in diameter along the margin, 20μ in the middle, and 24μ at the base. Trigones are present everywhere; they are usually small and triangular with straight or slightly bulging sides, but the latter are sometimes wavy and give the trigones a more irregular outline. Intermediate thickening are rare near the middle of the lobe, but become more numerous toward the margin; on the lobules they are everywhere abundant and are often more conspicuous than the trigones.

The underleaves are plane or nearly so and almost always distant, although they occasionally overlap toward the tip of a shoot. They are obovate from a narrowly cuneate base and measure about 0.4 x 0.27 mm. The apical sinus is narrow and about one-fourth the length of the underleaf, while the lobes are erect and triangular, with obtuse or acute apices. The lateral margins are entire or vaguely sinuate.

The female inflorescence is borne on a more or less elongated branch and usually gives off a robust branch just behind the involucre. The bracts are in two or three pairs. Those of the innermost pair are complicate, spreading to suberect, and unequally bifid. The lobe is ovate to obovate, measuring 0.9–1 x 0.6–0.65 mm., and the apex is broad and rounded; the lobule is more lanceolate in shape, measuring 0.85–0.95 x 0.35–0.45 mm., and the apex is acute or even acuminate; just above the middle a slender and sharp-pointed tooth-like lobe (stylus) is situated, measuring about 0.16 x 0.06 mm. The bracteole is ovate to obovate, about 0.85 mm. long and 0.3 mm. wide, the apical sinus is one-sixth to one-fourth its length and varies from acute to rounded, while the divisions are mostly acute to acuminate. The bracteole is highly connate with a lobule on one side and slightly or not at all connate on the other. The perianth is exserted for about half its length and is obovoid in form from a cuneate base. It measures 1.2–1.5 mm. in length and 0.75–0.95 mm. in width. When well developed it shows nine or ten folds or keels in the upper part, the two lateral keels, one dorsal keel, and two ventral keels being usually higher and more distinctly compressed than the others. The short and broad apical beak is entire at the mouth and usually lies in a distinct depression formed by the rounded upper extremities of the lateral keels, the apical margin of the perianth being consequently obcordate. The keels are usually smooth throughout, but are occasionally slightly roughened by projecting groups of cells.

The androecia occupy short globose branches, and are usually at some little distance from the archegonia, either on a different branch or on the same branch. In rare instances the branch just behind the involucre is occupied by an androecium. The bracts are closely imbricated and are in only two or three pairs; they are subequally bifid with a strongly arched keel; the lobes are rounded at the apex while the lobules vary from rounded to subacute. The bracteole, which is usually single, is small and bifid.

The closest relative of *F. mexicana* is without question *F. Rappii* Evans,[1] recently described from material collected at Sanford, Florida, by S. Rapp, and known from no other localities at the present time. In fact, if the description given above is carefully compared with the description and figures of *F. Rappii*, it will be found that many characteristics are shared by both. For example, they are both autoicous; they both have lobes and lobules built up on essentially the same plan; their underleaves are very similar; their cell-structure is almost identical with respect to the measurements of the cells and the distribution of the local thickening in their walls; and their perianths are much the same in form. And yet, in spite of these strong resemblances, there are a few slight differences which seem to be constant and which apparently warrant a specific separation. In *F. mexicana* the lobes are distinctly cordate at the dorsal base, the lobules are only 0.03 mm. from the axis, the divisions of the underleaves are never rounded and are usually acute, the lobules of the perichaetial bracts and the divisions of the underleaves tend to be lanceolate in outline and acute or acuminate at the apex, and the keels of the perianth usually number nine or ten. In *F. Rappii* the lobes are rounded at the dorsal base, the lobules are about 0.06 mm. from the axis, the divisions of the underleaves, the lobules of the bracts and the divisions of the bracteoles are often broad and rounded at the apex, and the keels of the perianth usually number five, although one or two low supplementary keels are occasionally present. In *F. cobrensis*,[2] another closely allied species from Cuba and Florida, the plants are smaller and each lobe bears a cluster of reddish enlarged cells at the base. In *F. eboracensis*, the commonest species of *Frullania* in the northern and eastern parts of North America, the lobules are smaller than in *F. mexicana*, and the inflorescence is dioicous.

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[1] BRYOLOGIST **15**: *22. f. 1-9.* 1912.

[2] See BRYOLOGIST **16**: 55. 1913.

10. FRULLANIA RIOJANEIRENSIS (Raddi) Spruce, Hep. Amaz. et And. 23. 1884. *Frullanoides riojaneirensis* Raddi, Mem. Soc. Ital. Modena Fis. **19**: 37. 1823; **20**: *pl.* 2, *f.* 4. 1829. *Frullania sebastianopolitana* Lindenb.; G. L. & N. Syn. Hep. 412. 1845.

Collected in March, 1915, on bark, at Brickell Hammock, Miami, Dade County, Florida, by J. K. Small (No. 5273). New to the United States, but widely distributed in tropical America. *F. riojaneirensis* belongs to the subgenus *Chonanthelia* and is the third member of this group to be reported from the United States, the other two being *F. arietina* Tayl. (from Florida) and *F. gibbosa* Nees (from Alabama). Its relationship to *F. arietina*[1] is especially close. It differs, however, in its inflorescence, which is autoicous instead of being paroicous. The sexual branch in *F. arietina* is very characteristic on account of the saccate perigonial bracts just below the involucre. In *F. riojaneirensis* there is a gradual series from the vegetative leaves of the female branch to the innermost perichaetial bracts, and the male inflorescence occupies a short branch in the vicinity of the involucre.

The number of species of *Frullania* now known from the United States (including Alaska) is twenty-eight. Only eleven of these are definitely known from Florida at the present time, but other species may reasonably be expected, especially in the more tropical portions of the state.

SHEFFIELD SCIENTIFIC SCHOOL, YALE UNIVERSITY.

EXPLANATION OF PLATE I

FIG. 1. Tip of a stem with perianth, dorsal view, the bract on the left torn and bent back, x 15.

FIG. 2. Part of a stem with a branch, dorsal view, x 15.

FIG. 3. Part of a stem with well-developed underleaves, ventral view, x 15.

FIGS. 4–6. Underleaves, x 15.

FIG. 7. An underleaf, x 35.

FIG. 8. An underleaf, coalescent with a leaf on the left, x 15.

FIGS. 9–11. Innermost bracts and bracteole of FIG. 1, x 15.

FIG. 12. Second bracteole of FIG. 1, x 15.

FIG. 13. Cross section of perianth of FIG. 1, x 35.

The figures were all drawn from the type specimen.

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[1] For a description of this species, with figures, see Evans, Trans. Connecticut Acad. **10**: 5. *pl. 1, f. 1-6.* 1897.